Allen-Bradley

POINT I/O Synchronous Serial Interface Absolute Encoder Module

1734-SSI

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com/) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid a hazard
- recognize the consequence

SHOCK HAZARD

Labels may be located on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.

BURN HAZARD

Labels may be located on or inside the equipment (for example, drive or motor) to alert people that surfaces may be dangerous temperatures.

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This publication contains new and revised information not in the last release.

New and Revised Information

See the table for a summary of the major changes in this manual.

Chapter	Change
Chapter 4 - Set and Operate Your Module	Updated section on operation of the Data Latch and Comparator features.
Chapter 5 - Diagnose Problems	Added a column on recommended actions in all of the troubleshooting charts.
Appendix A - Configure Modules in RSLogix 5000 Software	Updated procedures on how to use the Watch Position dialog.

Change Bars

We marked with change bars (as shown with this paragraph) the areas in this manual that are different from previous editions and indicate the addition of new or revised information.

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Purpose of This Manual

Read this manual for information about how to install, configure, and troubleshoot your module.

For This Information	See
Install the Module	Chapter 1
Configure the Module	Chapter 2
Communicate with Your Module	Chapter 3
Operate Your Module	Chapter 4
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Who Should Use This Manual

You must be able to use RSNetWorx software or similar configuration software to set up and calibrate these modules. You must have the capability to download and use electronic data sheet files.

In this manual, we assume you know how to do perform these tasks. If you do not, refer to your software user manuals or online help before attempting to use these modules.

Related Products and Documentation

For specification, safety approval, and other information, refer to POINT I/O Synchronous Serial Interface Absolute Encoder Module Installation Instructions, publication 1734-IN581.

For related 1734 products and documentation, see the table. Many of these publications are available online from http://literature.rockwellautomation.com

Description	Cat. No.	Publication
Analog Input Modules Installation Instructions	1734-IE2C 17340IE2V	1734-IN027
Analog Output Modules Installation Instructions	1734-OE2C 1734-OE2V	1734-IN002
DeviceNet Communication Interface Installation Instructions	1734-PDN	1734-IN057
Field Potential Distributor Installation Instructions	1734-FPD	1734-IN059
POINT I/O 24V dc Expansion Power Supply Installation Instructions	1734-EP24DC	1734-IN058
POINT I/O Selection Guide	1734 series	1734-SG001
Protected Output Module s Installation Instructions	1734-OB2E 1734-OB4E 1734-OB8E	1734-IN056
Relay Output Modules Installation Instructions	1734-OW2 1734-OW4	1734-IN055
Sink Input Modules Installation Instructions	1734-IB2 1734-IB4 1734-IB8	1734-IN051
Source Output Modules Installation Instructions	1734-IV2 1734-IV4 1734-IV8	1734-IN052
Very High-speed Counter Modules Installation Instructions	1734-VHSC5 1734-VHSC24	1734-IN003
Wiring Base Assembly Installation Instructions	1734-TB 1734-TBS	1734-IN511
Wiring Base Assembly Installation Instructions	1734-TB3 1734-TB3S	1734-IN013

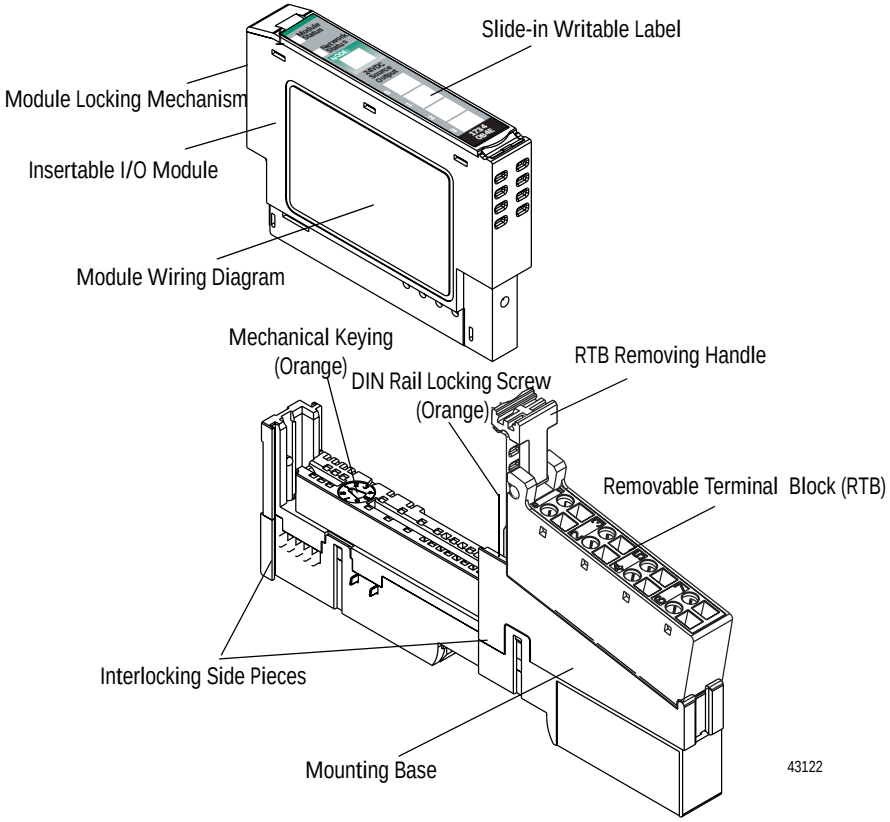
Install the Module

About This Chapter

Read this chapter to learn about how to install, wire, and remove the 1734-SSI module.

About the Module

The 1734-SSI module collects serial data from industrial absolute-position encoding sensors that use a standard SSI protocol.



Insert the module into a POINT I/O terminal base that provides common power, communication, and wiring connections for the SSI sensors. Use this Series C module with the following.

- ControlNet adapter
  with RSLogix 5000 software, version 11 or later
- DeviceNet adapter
- EtherNet/IP adapter
  with RSLogix 5000 software, version 11 or later
- PROFIBUS adapter

Install the Mounting Base

The wiring base assembly (1734-TB or 1734-TBS) consists of a mounting base (1734-MB) and a removable terminal block (1734-RTB or 1734-RTBS). You can install the assembly, or just the mounting base. To install the mounting base/wiring base assembly on the DIN rail, proceed as follows.

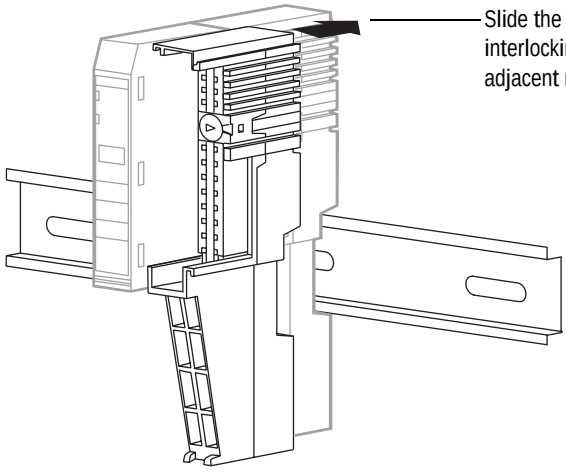
ATTENTION

POINT I/O is grounded through the DIN rail to chassis ground. Use zinc-plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail material (such as aluminum and plastic) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding.

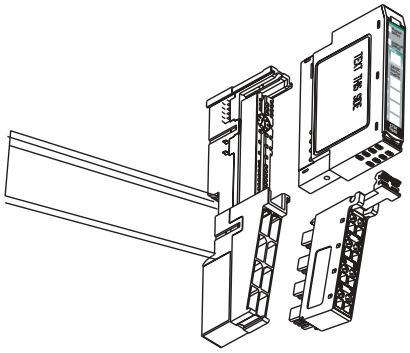
Secure DIN rail to mounting surface approximately every 200 mm (7.8 in.).

1. Position the mounting base/wiring base assembly vertically above the installed units (adapter, power supply, or existing module).

2. Slide the mounting base down, allowing the interlocking side pieces to engage the adjacent module or adapter.



3. Press firmly to seat the mounting base on the DIN rail, noting that the mounting base snaps into place.



44013

4. To remove the mounting base from the DIN rail, remove any installed module (and any module immediately to the right), and use a small-bladed screwdriver to rotate the DIN rail locking screw to a vertical position.

   This releases the locking mechanism.

5. Lift straight up to remove the mounting base.

6. Repeat this procedure for the next mounting base assembly.

Install a Module

Install the module before or after base installation. Make sure that the mounting base is correctly keyed before installing the module into the mounting base. In addition, make sure the mounting base locking screw is horizontal referenced to the base.

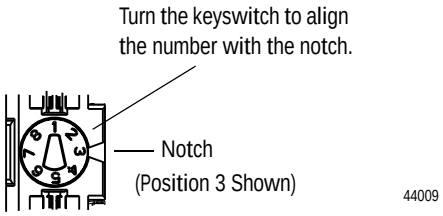
WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

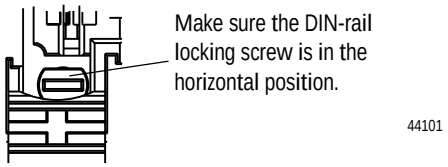
Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise till the number required for the type of module being installed aligns with the notch in the base.

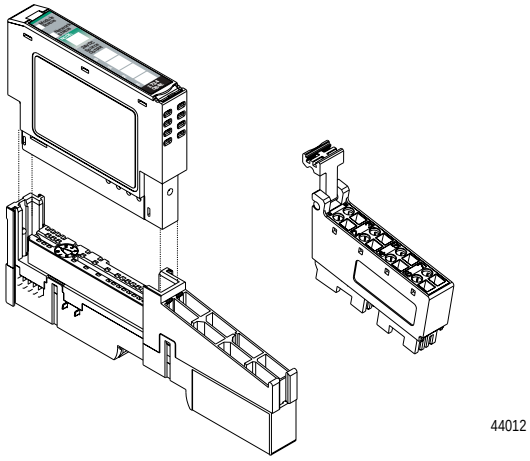
   1734-SSI - Position 2



2. Make sure the DIN-rail locking screw is in the horizontal position, noting that you cannot insert the module if the locking mechanism is unlocked.



3. Insert the module straight down into the mounting base and press to secure, locking the module into place.



Install the Removable Terminal Block

A removable terminal block comes with your mounting base assembly.

To remove, pull up on the RTB handle. This lets you remove and replace the base as necessary without removing any of the wiring.

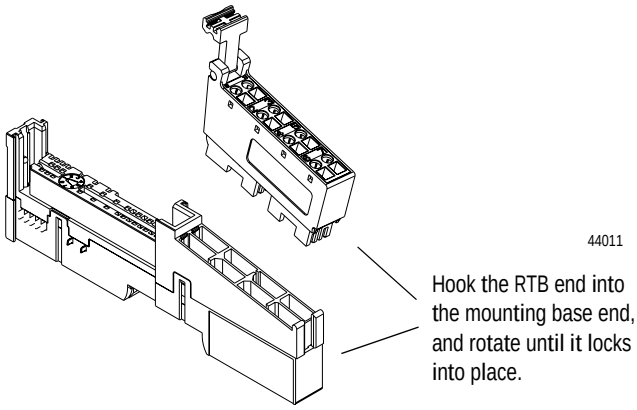
To reinsert the removable terminal block, proceed as follows.

WARNING

When you connect or disconnect the removable terminal block (RTB) with field-side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

1. Insert the RTB end opposite the handle into the base unit, noting that the end has a curved section that engages with the mounting base.



2. Rotate the terminal block into the mounting base until it locks itself in place.

3. If an I/O module is installed, snap the RTB handle into place on the module.

Remove a Mounting Base

To remove a mounting base, you must remove any installed module, and remove the removable terminal block (if wired).

1. Unlatch the RTB handle on the I/O module.
2. Pull on the RTB handle to remove the removable terminal block.

WARNING

When you connect or disconnect the removable terminal block (RTB) with field-side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

3. Press in on the module lock on the top of the module, and pull up on the I/O module to remove from the base.
4. Remove the module to the right of the base you are removing.

   The interlocking portion of the base sits under the adjacent module.

WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

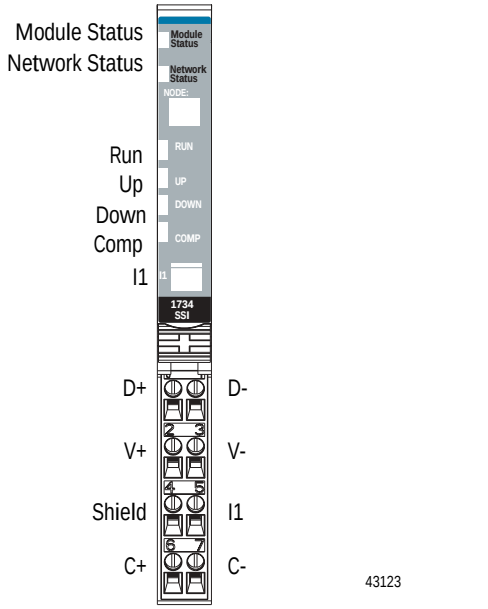
5. Use a small-bladed screwdriver to rotate the orange DIN-rail locking screw on the mounting base to a vertical position, releasing the locking mechanism.
6. Lift the mounting base straight up to remove.

Wire the Module

Read this section for information about wiring the module.

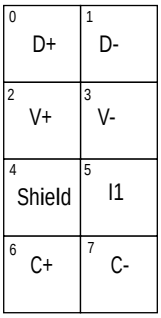
WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.



D = Data
C = Clock

I1 = Digital Sourcing Input 1
V = SSI Sensor



D = Data
C = Clock

I1 = Digital Sourcing Input 1
V = SSI Sensor

Module Terminations	
0	D+[1]
1	D-[1]
2	V+
3	V-
4	Shield
5	I1
6	C+[1]
7	C-[1]

1 D and C are RS422-type differential pairs.

Configure the Module

About This Chapter

Read this chapter for information about how to use RSNetWorx for DeviceNet software to configure your module. You can configure the module while it is online or offline.

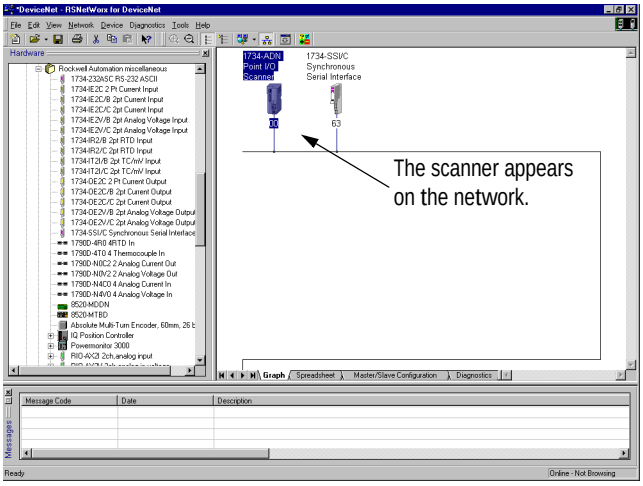
This chapter shows configuration in the online mode. Configuration dialogs appear similar in both modes. The primary difference is that if you make changes offline, you must go online before the configuration changes take effect.

Add the Adapter to Your Network

To add the adapter to your network, follow these steps.

1. Start the RSNetWorx for DeviceNet software.
2. Add the communication device as shown, noting that in this case, the chosen device was a 1734-ADN DeviceNet adapter.

1. Click here to expand the list of communication adapters.
2. Double-click the 1734-ADN DeviceNet adapter. (You can also click and drag the adapter name onto the network.)

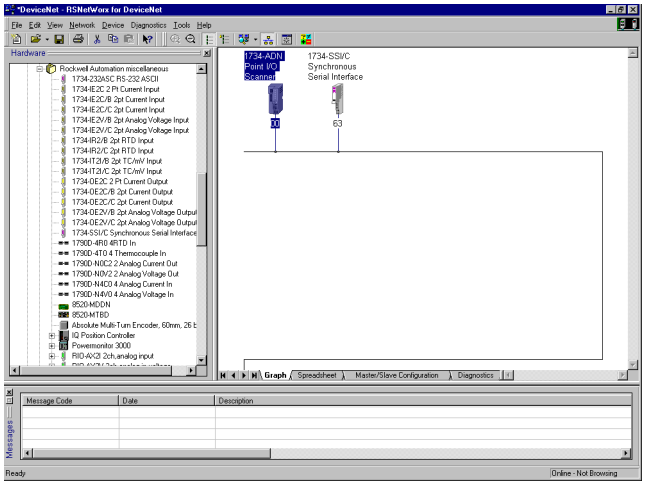


Add I/O Modules to Your Network

After you add the communication device, you must add the POINT I/O modules connected to the scanner on the POINTBus backplane, using this procedure.

1. Add modules as shown in the figure.

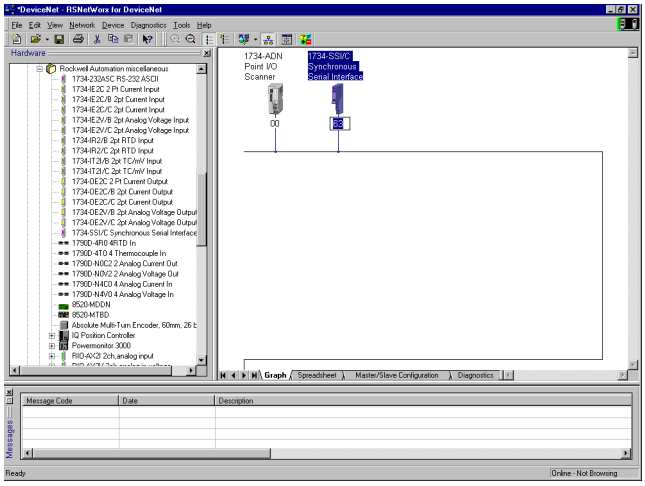
1. Click here to expand the list of specialty modules.
2. Double-click the catalog number to choose the module. You can also click and drag the module name onto the network.



The out-of-the-box node setting for 1734 modules is 63. You can change the setting by using the node commissioning tool. The node commissioning tool is available either online or offline.

IMPORTANT If you commission a node online, you must power down your system before the change takes place.

2. Double-click the module to change the node address.



Set the Encoder's Parameters

After adding the module to the network, you must configure the module for use.

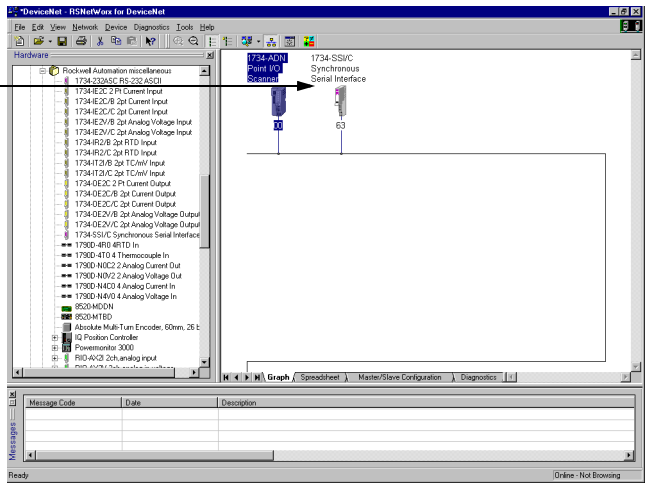
IMPORTANT This chapter shows configuration in the online mode. Changes set in this mode take effect when you download to the individual module.

1. Configure the modules as shown in the figure.

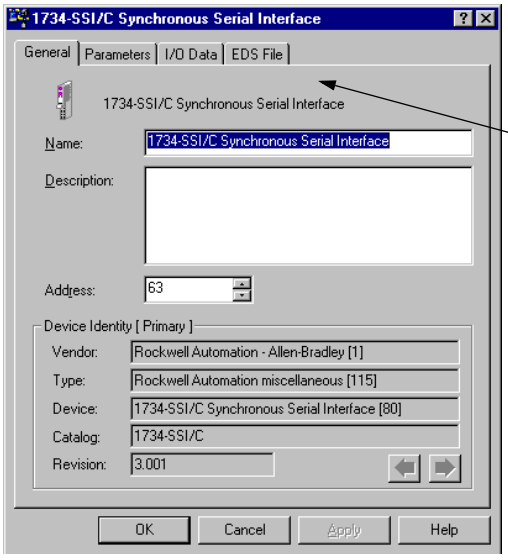
1. Click the module to highlight it.

2. From the Device menu, choose Properties.

You can also right-click the module or name, and the property dialog pops up.

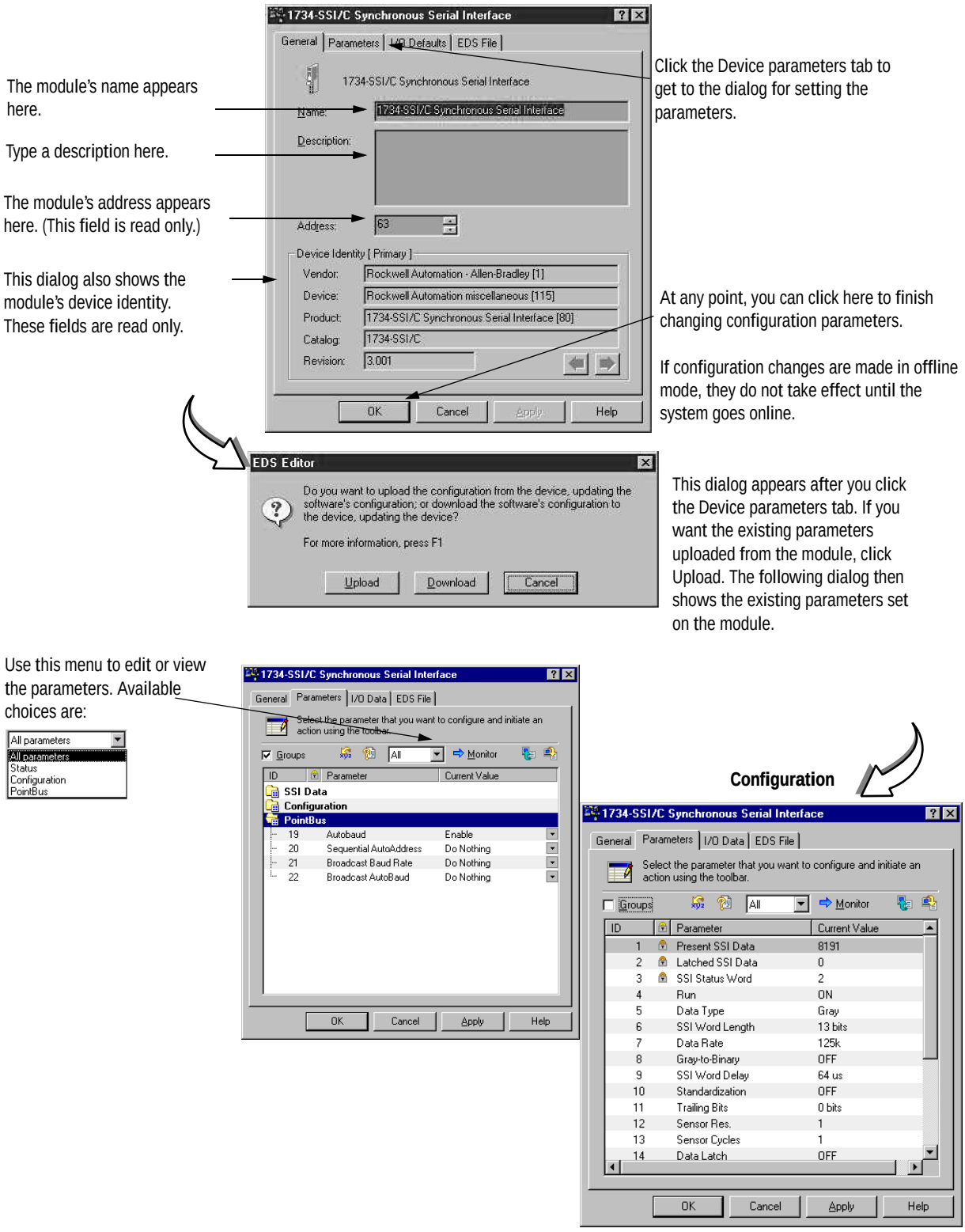


You see a dialog with a series of tabs. Each tab provides options to view or edit.



These are the tabs you click to view the options.

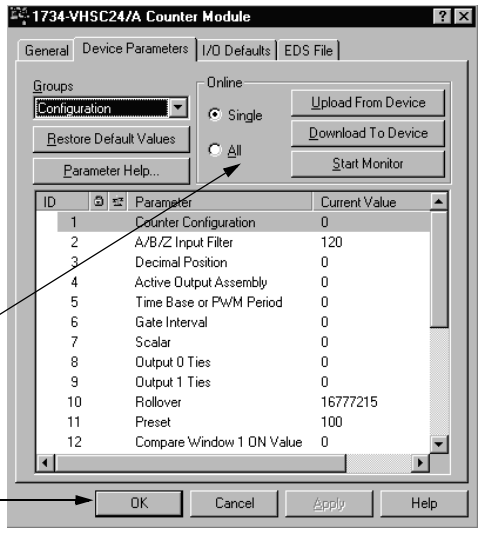
2. Refer to the dialogs for an explanation of features.



To configure your module, select Configuration and modify the parameters as desired for your application.

When complete, download to your module by clicking the Download to Device button. You can download each change as you make it using Single, or download all your changes using All.

Click here when finished.

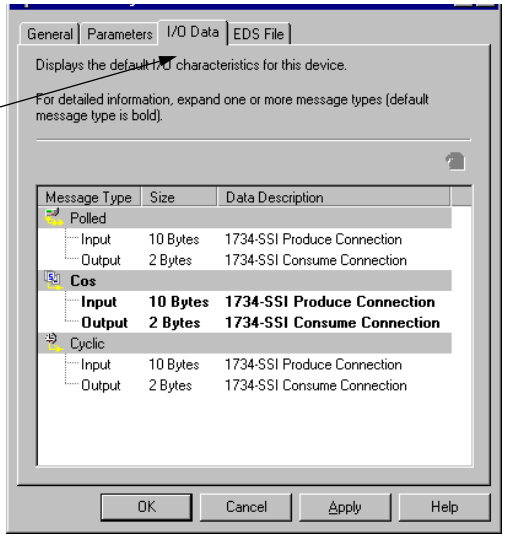


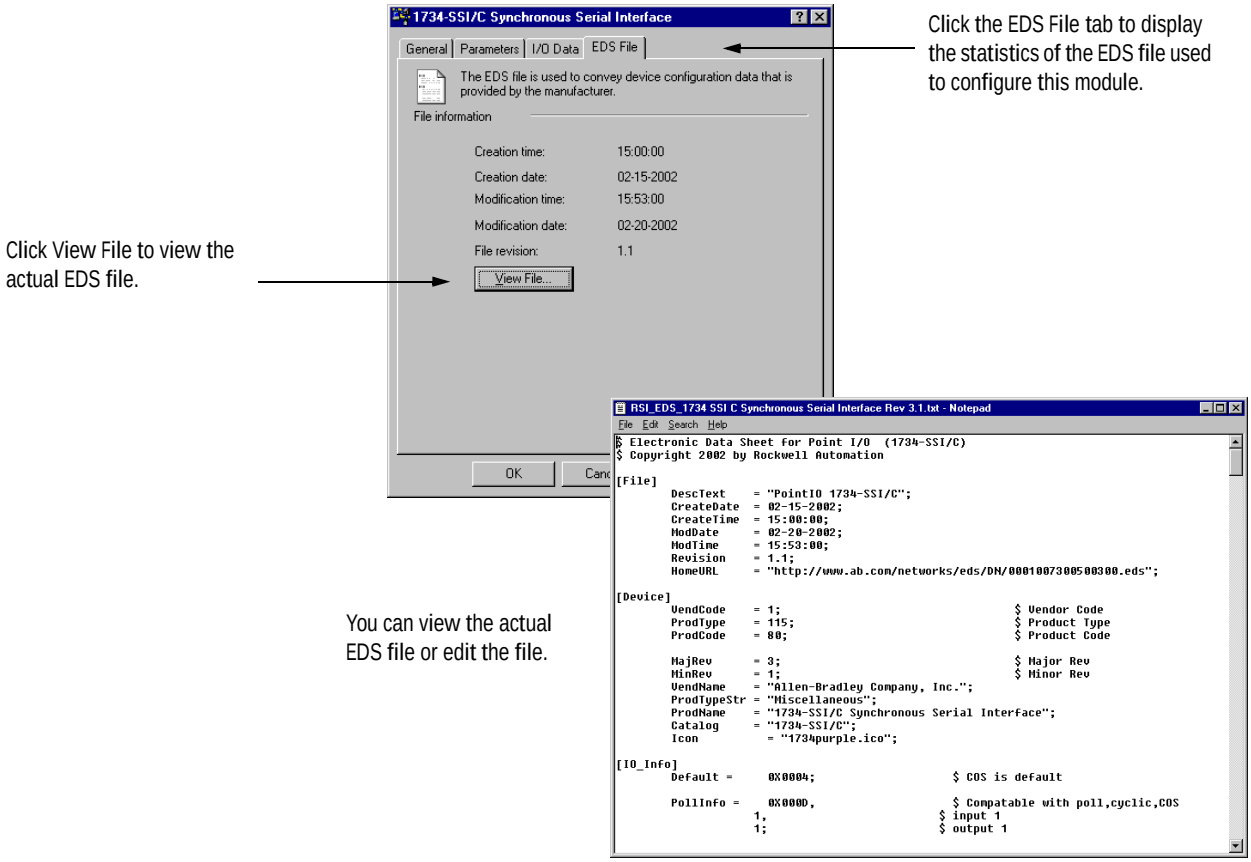
Check I/O Status and View the EDS File

You can view the I/O defaults setup, and the EDS file by clicking the appropriate tab.

Click the I/O Data tab to display the default characteristics for this module.

This dialog shows the input/output defaults for the four modes. These are:
Strobe
Polled
Change of state
Cyclic




1734-SSI/C Synchronous Serial Interface
General
Parameters
I/O Data
EDS File
The EDS file is used to convey device configuration data that is provided by the manufacturer.
File information
Creation time: 15:00:00
Creation date: 02-15-2002
Modification time: 15:53:00
Modification date: 02-20-2002
File revision: 1.1
View File...
OK
Click the EDS File tab to display the statistics of the EDS file used to configure this module.
Click View File to view the actual EDS file.
RSI_EDS_1734 SSI C Synchronous Serial Interface Rev 3.1.txt - Notepad
File Edit Search Help
$ Electronic Data Sheet for Point I/O (1734-SSI/C)
$ Copyright 2002 by Rockwell Automation
[File]
DescText = "PointIO 1734-SSI/C";
CreateDate = 02-15-2002;
CreateTime = 15:00:00;
ModDate = 02-20-2002;
ModTime = 15:53:00;
Revision = 1.1;
HomeURL = "http://www.ab.com/networks/eds/DN/0001007300500300.eds";
[Device]
VendCode = 1; $ Vendor Code
ProdType = 115; $ Product Type
ProdCode = 80; $ Product Code
MajRev = 3; $ Major Rev
MinRev = 1; $ Minor Rev
VendName = "Allen-Bradley Company, Inc.";
ProdTypeStr = "Miscellaneous";
ProdName = "1734-SSI/C Synchronous Serial Interface";
Catalog = "1734-SSI/C";
Icon = "1734purple.ico";
[IO_Info]
Default = 0X0004; $ COS is default
PollInfo = 0X000D, $ Compatable with poll,cyclic,COS
1, $ input 1
1; $ output 1
You can view the actual EDS file or edit the file.

Communicate with Your Module

About This Chapter

Read this chapter for information about how the 1734-SSI module transmits SSI sensor data over the DeviceNet network.

About Communications

Data can be exchanged with the master through a polled, cyclic, or change-of-state connection. Bit-strobe Command Response Messaging and the Unconnected Message Manager (UCMM) are not supported.[1] The module produces and consumes data as follows:

I/O Connection Type	Consumes	Produces
Polled	2 bytes	10 bytes
Cyclic	2 bytes	10 bytes
Change-of-state	2 bytes	10 bytes

See the following tables for consume and produced bit and byte definitions.

Byte	Bit	Description
Produce 0	0…7	Low byte of present low SSI word. Bit 0 is the least significant bit of the entire present SSI word.
Produce 1	0…7	High byte of present low SSI word.
Produce 2	0…7	Low byte of present high SSI word.
Produce 3	0…7	High byte of present high SSI word. Bit 7 is the most significant bit of the entire present SSI word.
Produce 4	0…7	Low byte of latched low SSI word. Bit 0 is the least significant bit of the entire latched SSI word.
Produce 5	0…7	High byte of latched low SSI word.
Produce 6	0…7	Low byte of latched high SSI word.
Produce 7	0…7	High byte of latched high SSI word. Bit 7 is the most significant bit of the entire latched SSI word.

[1] If you are not familiar with these terms, see the DeviceNet Specification for definitions (online: www.odva.org).

Byte	Bit								Description
Produce 8	7	6	5	4	3	2	1	0	Status Byte 0
	C2ST	C1ST	C2R	C1R	INC	DEC	RUN	I1	
Produce 9	7	6	5	4	3	2	1	0	Status Byte 1[1]
	RES	RES	RES	LHON	IDF[2]	CCE	CCF	SPF	

1 Monitor IDF to determine the validity of the produced data. If IDF=1, the SSI data is false.

Byte	Bit								Description
Consume 0	7	6	5	4	3	2	1	0	Master ACK Byte[2]
	RES	RES	RES	SCMP2	SCMP1	CC2	CC1	LACK	
Consume 1	7	6	5	4	3	2	1	0	CONS1
	RES	RES	RES	RES	RES	RES	RES	RES	

2 The master must provide the Master ACK Byte in order to receive the polled Produced bytes 0…9.
I1 = Input 1 Status (1 = Input 1 ON, 0 = OFF)
RUN = SSI Clock Output Status (1 = Clock Output ON, 0 = OFF)
DEC = SSI Data Count Decreasing (1 = Decreasing, 0 = Not Decreasing)
INC = SSI Data Count Increasing (1 = Increasing, 0 = Not Increasing)
C1R = Comparator 1 Value Reached (1 = Value Reached, 0 = Not Reached)
C2R = Comparator 2 Value Reached (1 = Value Reached, 0 = Not Reached)
C1ST = Comparator 1 Active (1 = Active, 0 = Not Active)
C2ST = Comparator 2 Active (1 = Active, 0 = Not Active)
SPF = SSI Sensor Power Fault (1 = Fault Present, 0 = No Fault)
CCF = Coprocessor Configuration Fault (1 = Fault Present, 0 = No Fault)
CCE = Coprocessor Communication Error (1 = Error Present, 0 = No Error)
IDF = SSI Input Data Fault (1 = Fault Present, 0 = No Fault)
LACK = Input 1 Latch Acknowledge (1 = Unlatch, 0 = No Fault)
CC1 = Clear Comparator 1 (1 = Clear)
CC2 = Clear Comparator 2 (1 = Clear)
SCMP1 = Set Comparator 1 (1 = Comparator 1 is Active)
SCMP2 = Set Comparator 2 (1 = Comparator 2 is Active)
RES = Reserved (Bit = 0)
LHON = Latched Data is Stored (1 = Latched Data Present, 0 = Latched Data Not Present)

Communicate Real-time Information

The Synchronous Serial Interface Absolute Encoder module uses data bytes composed into assemblies to communicate real-time input and output data over an I/O connection, as well as non-real-time module information by using an Explicit Messaging connection.

- Assembly 101 is produced data sent by the module over an I/O or Explicit Messaging connection.
- Assembly 102 is consumed data that is received by the module over an I/O or Explicit Messaging connection.
- Assembly 103 is configuration data that can be read or changed over an Explicit Messaging connection.

The following table shows the 1734-SSI module data assemblies.

Firmware Version 3.001 Only

Instances	Services	Field	Bytes
#101 (0x65)	Get	Present SSI Data	4
		Stored SSI Data	4
		Module Status	2
#102 (0x66)	Set/Get	Master Ack Byte	1
		CONS1	1
#103 (0x67)	Set/Get	Run	1
		Gray/Binary	1
		SSI Word Length	1
		Data Rate	1
		Gray to Binary Conversion	1
		Standardization	1
		SSI Word Delay Time	2
		Trailing Bits	1
		Latch Input Control	1
		Sensor Resolution	2
		Sensor Cycles	2
		Alignment Byte (0x00)	2
		Comparator 1 Value	4
		Comparator 2 Value	4
		Comp 1 Control	1
		Comp 2 Control	1

	Instances	Services	Field	Bytes
Firmware Version 4.001 and above	**#123** (0x7B)	Set/Get	Run	1
			Gray/Binary	1
			SSI Word Length	1
			Data Rate	1
			Gray to Binary Conversion	1
			Standardization	1
			SSI Word Delay Time	2
			Trailing Bits	1
			Latch Input Control	1
			Sensor Resolution	2
			Sensor Cycles	2
			SSI Word Filter Control	1
			Alignment Byte (0x00)	1
			Comparator 1 Value	4
			Comparator 2 Value	4
			Comp 1 Control	1
			Comp 2 Control	1

The following table shows the Instance Services provided by the Parameter Object (Attribute = 1).

Parameter	Services	Field	Bytes
1	Get	Present SSI Word	4
2		Latched SSI Word	4
3		SSI Status Word	2
4	Get/Set	Run	1
5		Gray/Binary	1
6		SSI Word Length	1
7		Data Rate	1
8		Gray to Binary Conversion	1
9		SSI Word Delay Time	2
10		Standardization	1
11		Trailing Bits	1
12		Latch Input Control	1
13		Sensor Resolution	2
14		Sensor Cycles	2
15		Comp 1 Control	1
16		Comparator 1 Value	4
17		Comp 2 Control	1
18		Comparator 2 Value	4
19		SSI Word Filter Control(1)	1

(1) This parameter is present in firmware version 4.001 and later.

Operating Modes

The operating modes of the 1734-SSI module are essentially the parameters you set through the RSNetWorx EDS file. This table lists parameters you set.

Parameter	Value(1)	Notes
Run	**Enable**/Disable	Turns SSI data clock on or off
Data Type	Binary or **Gray**	SSI sensor's data type
Data Word Length	2…31 (**13**)	Length of the received serial data word can be any size between 2 and 31 data bits. Bit 32 is used for Latch Input detection.
Data Rate	**125**/250/500K baud, 1/2M baud	Speed of SSI data clock

Parameter	Value[1]	Notes
Gray to Binary Conversion	**No**/Yes	Convert data from Gray to binary
SSI Word Delay Time (t_m)	16µs… to 64ms (**64µs**)	Delay time between successive SSI data words
SSI Word Filter Control	Off, Low, Med, High, **Max**	Corresponds to the number of successive equal SSI data words that must be received by the module in order to update the real-time present SSI data word.
Standardization	**Off**/On	Off = Use entire data word length specified by Data Word Length parameter. On = Data is right-shifted the number of bits specified in the Trailing Bits parameter.
Trailing Bits	**0**… 16	
Sensor Resolution	**1**… 65535	Total number of positions/revolution for a rotary encoder, positions/stroke for a linear displacement transducer, or maximum counts for distance measurement.
Sensor Cycles	**1**… 65535	Total number of revolutions for a rotary encoder, strokes for a linear displacement transducer
Latch Input	**Off**, Rising Edge, Falling Edge, Both Edges	Master unlatches data by transmitting the LACK bit over the network
Comparator 1	**Not Active**, Up Direction, Down Direction, Both Directions	Module compares data to value from the master. Only one Compare value can be active.
Comparator 2	**Not Active**, Up Direction, Down Direction, Both Directions	Module compares data to value from the master. Only one Compare value can be active.

(1) Default values are in bold.

Set and Operate Your Module

About This Chapter

Read this chapter for information about setup and operation of your module.

You need to alter the 1734-SSI module configuration, special data latch feature, and comparator feature in order for the 1734-SSI module to operate properly with your SSI sensor.

To quickly configure the 1734-SSI module for use with your SSI sensor, change only the following values if they are different from the module default values:

- Data type
- SSI word length
- Data rate
- SSI word delay

Module Configuration Value Definitions

Value	Definition
RUN	The SSI clock output to the SSI sensor can be turned ON or OFF by changing the RUN setting. You may find this feature useful during machine setup or maintenance. The default setting for RUN is ON. When you first apply power to the module, the SSI clock output is active. The green LED on the front of the module indicates the RUN status, as well as Bit 1 or Byte 0 in the module status word (produced byte 8, Bit 1; 1 = RUN ON, 0 = RUN OFF).
Data Type	This refers to the code type of your SSI sensor. The 1734-SSI module supports Gray and Binary code types. The module default is Gray. You must have the right code type selected so that other module features operate correctly.
SSI Word Length	The number of bits in a single SSI word is completely determined by the SSI sensor. See the manufacturer's data sheet for the sensor output word size. The word length setting range is 2…31 bits. The default SSI word length is 13 bits.

Value	Definition
Data Rate	The data rate is the SSI sensor's communication rate (bits/s) stated in the manufacturer's data sheet. The data rate you select at the SSI module equals the approximate frequency of the SSI module's clock output (the actual measure frequency varies with the SSI word delay time). The maximum data rate that can be used for your application is limited by the transmission line length between the SSI module and sensor. See the SSI sensor data sheet, as well as the 1734-SSI Installation Instructions, publication 1734-IN581, for communication rate versus transmission line length information. The module supports the following SSI data rates: 125, 250, 500 Kbps, 1 and 2 MBps. The module default rate is 125 Kbps.
Gray-to-Binary Conversion	The 1734-SSI module can change the displayed SSI sensor data from Gray to Binary. Change this setting to ON only when using a Gray-code sensor and you wish to read a present SSI value that is proportional to total sensor travel. Gray-code sensor values continuously increase and decrease as the sensor travels in one direction, and do not provide a sense of proportionality. The module default for this setting is OFF.
SSI Word Delay Time	This is the time between successive SSI words that are transmitted by the SSI sensor to the module. The 1734-SSI module features a wide selection of delay times ranging from 16…64,535 µs. The module default delay time is 64 µs. Refer to your SSI sensor data sheet for the recommended delay time. If the sensor manufacturer specifies a value called monoflop time, use that value for the SSI word delay time setting.
SSI Word Filter Control	The number of successive, equal SSI data words received by the module from the SSI sensor in order to update the real-time present SSI data word. Max = 5 successive equal values, High = 4, Med = 3, Low = 2, and Off = the module produces a SSI data word each time a new value is available from the SSI sensor, without the previous value comparison. Adjust the SSI Word Filter Control value when using SSI sensors with the Position Forming time < 0.5 ms, so that you can see SSI sensor data change as the sensor is in motion. Note that changing the default value of 5 (Max) for this parameter is done at the expense of reporting accurate sensor data in an electrically noisy environment.
Data Standardization	You can remove bits from the right side of the displayed SSI present value word by setting Data Standardization to ON. This feature can be used as a divide by a power of two, or for data masking. Enter the number of bits you wish to remove in the Trailing Bits parameter (discussed below). The default setting for Data Standardization is OFF.
Trailing Bits	The number of bits removed from the displayed SSI present value word if Data Standardization is ON. The range is 0…16 bits, and the default value is 0.

Value	Definition
Sensor Resolution	The number of steps per revolution for a rotary sensor, or total number of steps per stroke for a linear or optical transducer. The Sensor Resolution value is not used by the module and is not needed for proper module operation with your SSI sensor. The Sensor Resolution value can be passed to the network master for processing if desired. The range is 1…65,535 steps and the default value is 1.
Sensor Cycles	The total number of revolutions for a rotary sensor. If you are using a linear or optical transducer, the value you should enter for Sensor Cycles is most likely equal to one. Like the Sensor Resolution parameter, the Sensor Cycle value is not used by the module and is not needed for proper module operation with your SSI sensor. Pass the value to the master if needed. The range is 1…65,535 steps and the default value is 1.
Data Latch	Define an edge of the sourcing I1 input for storing a sensor position. The choices are the falling edge of I1 (Off-to-ON), rising edge (On-to-OFF), or both falling edge and rising edge. The default value for Data Latch is OFF. For operation details, see operating feature of Data Latch.
Comparator 1 and Comparator 2 Control	You can compare the incoming SSI sensor count to a stored value, and the module provides notification of the event when the present sensor value equals or exceeds the stored value. The module stores two separate comparator values (1 and 2), governed by separate comparator control values (1 and 2). Using the comparator control parameter, you can set the module to flag the event on an increasing, decreasing, or both (increasing and decreasing) sensor count. The default setting for both of the Comparator 1 and Comparator 2 Control values is OFF. For operation details, see operating features of Comparator 1 and Comparator 2 Control.
Comparator 1 and Comparator 2 Value	Enter your comparator value into these parameters. Comparator values can be obtained by moving your SSI sensor to the position of interest and reading the present SSI value.

Operation of the Data Latch and Comparator Features

Read this section for information about operation of the Data Latch and Comparator features.

Data Latch

See the table for a listing of values for DeviceNet name, RSLogix 5000 tag, and RSLogix 5000 field name.

Data Latch		
DeviceNet Name	**RSLogix 5000 Tag**	**RSLogix 5000 Field Name**
Bit 0 of Status Byte 0	Input	InputStatus
LHON:	Input	DataLatched
LACK	Output	LatchAck

SSI sensor positions can be stored with operation of the digital input (I1). The I1 input is sourcing (IEC Type 3 compatible); thus grounding the input turns it ON. The yellow I1 LED on the front of the SSI module also illuminates when the I1 input is ON.

The I1 input is edge-sensitive: the module can react to rising or falling edges of I1. Choosing the falling data latch value provides OFF-to-ON data latching, and choosing the rising value provides ON-to-OFF latching. Choose the Both value if you need OFF-to-ON and ON-to-OFF data latching simultaneously.

With one of the Latch Input modes active, watch the module Status Word (status bytes 0 and 1) for I1 input operation. When I1 is ON, bit I1 in Status Byte 0 (bit 0 of Status Byte 0) is 1. If I1 is OFF, the I1 bit is 0. When the I1 input is activated corresponding to the Latch Input mode, the current SSI sensor value is stored in produced bytes 4 to 7.

The LHON bit (bit 4 of Status Byte 1) will be set to 1. To unlatch the stored value, toggle (set to 1 for about 0.5 ms, then back to 0) the LACK bit, which is bit 0 of the Master Ack Byte. The Master Ack Byte is consumed Byte 0 sent by the master to the 1734-SSI module. Once the LACK bit is toggled, LHON is set back to 0 and the produced bytes 4 to 7 return to 0 as well. You can also unlatch stored data by turning the Latch Input parameter OFF through the configuration. The LHON bit returns to 0 as well when the Data Latch is turned OFF through the configuration.

Comparators 1 and 2

You can store two separate four-byte values and be notified when the SSI sensor attains or exceeds the stored value. Comparators 1 and 2 are mutually exclusive: only one comparator can be active at any given time.

You can set a comparator to trigger on an increasing sensor count, decreasing count, or regardless of sensor direction, by choosing Both for the comparator control value. There are two modes of comparator operation: manual and automatic. The green COMP LED on the front of the module illuminates when a comparator value is reached. The LED goes OFF when comparator reset occurs.

See the table for a listing of values for DeviceNet name, RSLogix 5000 tag, and RSLogix 5000 field name for Manual and Automatic mode.

Manual and Automatic Mode

DeviceNet Name	RSLogix 5000 Tag	RSLogix 5000 Field Name
C1ST	Input	Compare0Status
C2ST	Input	Compare1Status
CC1	Output	Compare0Ack
CC2	Output	Compare1Ack
C1R	Input	Compare0Reached
C2R	Input	Compare1Reach
SCMP1	Output	Compare0Select
SCMP2	Output	Compare1Select

Manual Mode

Select Manual mode by entering a comparator value and a corresponding control value (increasing, decreasing, or both). If you are using Comparator 2, for example, you notice Bit 7 of Status Byte 0 (C2ST) is 1 when Comparator 2 is active. To reset the comparator, toggle (set to 1 for at least 0.5 ms, then back to 0) the Comparator 2 acknowledge bit, Bit 2 of the Master Ack Byte (CC2).

You can also reset Comparator 2 by turning it OFF through the configuration. Comparator 1 uses Bits 6 (C1ST) and Bit 4 (C1R) of Status Byte 0 for operation. Bit1 (CC1) of the Master Ack Byte is used for reset. Like Comparator 2, you can also reset Comparator 1 by turning it OFF through the configuration.

Automatic Mode

The purpose of the Automatic mode is to provide a means of switching between two comparator values without having to activate each comparator separately through the configuration.

In Automatic mode, only the Both comparator control setting is active for Comparator 1 and Comparator 2. There is no provision to choose between the comparator control settings in Automatic mode.

In Automatic mode, you must first enter values for Comparator 1 and Comparator 2 through the configuration. Enforce bit 3 of the Master Ack byte (SCMP1) by setting it to 1. Make sure bit 4 of the Master Ack Byte (SCMP2) is set to 0 when you enforce SCMP1.

Notice that C1ST is now 1, indicating that the Comparator 1 is active. When the SSI sensor reaches the Comparator 1 value and the C1R bit is 1, enforce SCMP2 by setting it to 1.

IMPORTANT After setting SCMP2 to 1, set SCMP1 to 0. Setting them both to 0 at the same time cancels Automatic mode.

Notice that C2ST is now 1, indicating that Comparator 2 is active. Also notice that C1ST and C1R are now 0. When the sensor reaches the Comparator 2 value, C2R gets set to 1. You may now repeat the cycle by enforcing SCMP1 while setting SCMP2 to 0. Cancel Automatic mode by setting both SCMP1 and SCMP2 to 0.

Other Module Features

The Module Status word, consisting of Status Bytes 0 and 1, contains information regarding module operation.

The DEC and INC bits, bits 2 and 3, respectively, of Status Byte 0, indicate sensor count direction as the SSI sensor is in motion. Watch these bits change as the SSI sensor changes direction. If the count is currently increasing, INC is 1. When the count decreases, DEC is 1. If INC and DEC are both 0, the SSI sensor is not in motion, or is moving very slowly. There are two green LEDs (INC and DEC) on the front of the module, which also indicate the SSI sensor count direction.

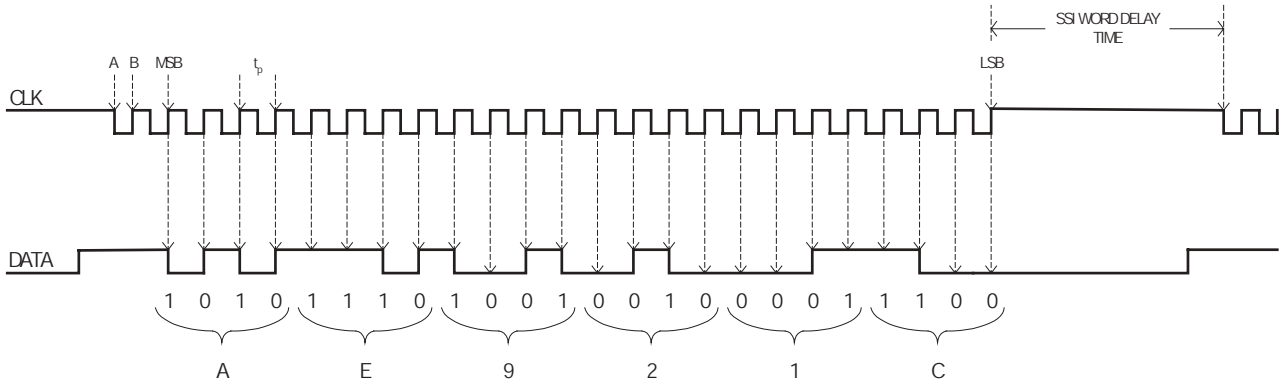
The lower bits of Status Byte 1 provide module troubleshooting information. If the SPF (bit 0 of Status Byte 1) bit is 1, the SSI sensor power provided at the module terminal block is shorted, or the SSI power is not present. This causes incorrect SSI sensor data to be collected by the module.

Major module faults are indicated by the presence of the CCF and CCE bits, bits 1 and 2 respectively of Status Byte 1.If either of these bits is 1, you do not receive correct SSI sensor data. Try resetting the module with a power cycle.

If either of these bits remain ON, call technical support for further assistance.You can monitor power or major module faults by monitoring a single bit in Status Byte 1; the IDF bit (bit 3 of Status Byte 1). We recommend that you place the IDF bit in your ladder logic as an indicator of SSI sensor data integrity. If the IDF bit is set to 1 for any of the reasons discussed above, you can quickly switch your system to a safe state for troubleshooting.

Example of Using the 1734-SSI Module with a 24-bit SSI Sensor

See the diagram that illustrates the SSI clock (CLK) signal that is sent to the SSI sensor by the 1734-SSI module and the SSI data (DATA) coming back to the module from the sensor.



The CLK and DATA signals are representative of what you could actually see on an oscilloscope when the module is attached to a SSI sensor in a live system. The SSI module must be configured for a SSI Word length of 24, as well as the proper Data Rate and SSI Word Delay time stated in the SSI sensor specifications.

SSI Word Delay time is approximately equal to a value called monoflop time, as stated by some SSI sensor manufacturers. When configuring the 1734-SSI module, enter the monoflop time value for SSI Word Delay time.

Point A of the CLK signal is a falling clock edge. When the SSI sensor sees the first falling clock edge after a delay period, it knows to latch its current position into a parallel-to-serial converter located in the sensor.

At point B of the CLK signal is the rising clock edge. The sensor begins to send its serial data to the 1734-SSI module. The module actually starts reading the sensor position data on the next rising clock edge, denoted by MSB in the figure above. MSB is the most significant bit of the data word.

The 1734-SSI module supports only MSB aligned data. This means that the SSI sensor sends the MSB of its data word first, and the least significant bit (LSB) is sent last. Notice that it takes 25 rising clock edges to read in a 24-bit data word from a 24-bit SSI sensor. A 25-bit sensor needs 26 rising edges and a 13-bit sensor needs 14 edges. Configure the module for the SSI Word Length as stated in the sensor specifications and the module adds the extra rising edge automatically.

The value t_p shown in the CLK signal in the figure is the period of the SSI clock signal and is equal to the inverse of the SSI Data Rate; thus SSI Data Rate = $1/t_p$ bits/second (or communication rate). You can verify that your module is operating at the Data Rate that set in the module configuration by measuring t_p on an oscilloscope and calculating the Data Rate.

The actual bit values of the current SSI sensor position are shown beneath the Data signal in the figure. Note that a bit value is always the binary (0 or 1) value just before a given rising clock edge. The next binary value is sent by the SSI sensor just after the rising clock edge and is read by the module on the next rising clock edge.

When you group the binary values in sets of 4, starting with the LSB at the right of the DATA signal, and working up towards the MSB, you can calculate the hexadecimal value of the SSI sensor position.

The hexadecimal values are shown in the figure, below the brackets that denote each group of 4 bits. The Present SSI data word for this sensor position would be transmitted by the module as follows: Produce0 = 0x1C, Produce1 = 0x92, Produce2 = 0xAE, Produce3 = 0x00.

Produce3 is 0x00 because the 1734-SSI module always sends a 32-bit hexadecimal value and the sensor in this example is 24-bit. The Latched SSI data word, Produce 4 to 7, is similarly transmitted (low byte first) by the module when the data latch is activated.

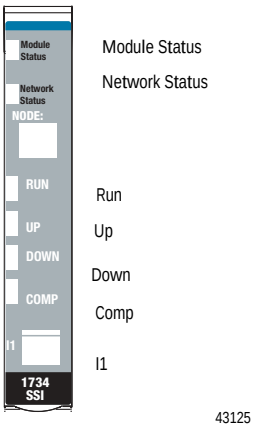
Diagnose Problems

About This Chapter

Read this chapter for information about how to troubleshoot using the module indicators.

Use the Indicators for Troubleshooting

Use these indicators to help you troubleshoot problems with your 1734-SSI module.



Indication	Probable Cause	Recommended Action
Module Status		
Off	No power applied to device.	Apply power to the device.
Solid Green	Device is operating normally.	None - device is operating normally.
Flashing Green	Device needs commissioning due to configuration missing, incomplete, or incorrect.	Configure device properly.
Flashing Red	Recoverable fault is present.	Cycle power to device. If condition persists, replace device.
Solid Red	Unrecoverable fault may require device replacement.	Unrecoverable fault may require device replacement.
Flashing Red/Green	Device is in self-test.	None - device is in self-test.

Indication	Probable Cause	Recommended Action
Network Status		
Off	Device is not online. - Device has not completed dup_MAC_id test. - Device not powered - check module status indicator.	Apply power to device.
Flashing Green	Device is online but has no connections in the established state.	None - device is in Idle or Program mode.
Solid Green	Device is online and has connections in the established state.	None
Flashing Red	One or more I/O connections are in timed-out state.	Check for module failure and correct as needed.
Solid Red	Critical link failure is present with failed communication device. Device detected error that prevents it communicating on the network.	Verify that adapter and terminal bases are properly installed, and reinstall, as needed.
Flashing Red/Green	Communication faulted device - the device detected a network access error and is in communication faulted state. Device received and accepted an Identify Communication Faulted Request - long protocol message.	Verify that adapter is properly installed, and reinstall, as needed.

Indication	Probable Cause	Recommended Action
Run Status		
Off	Module is commanded to stop retrieving SSI data.	Turn Run on to begin collecting SSI data.
Solid Green	Module is commanded to retrieve SSI data.	None
Up Status		
Off	SSI data is not increasing, or no SSI data is being received.	None
Solid Green	SSI data is increasing.	None
Down Status		
Off	SSI data is not decreasing, or no SSI data is being received.	None
Solid Green	SSI data is decreasing.	None
Comp Status		
Off	Comparator function is not in use, or comparator value not attained.	None
Solid Green	Comparator value is attained.	None
I1 Status		
Off	Latching input I1 is OFF.	None
Solid Yellow	Latching input I1 is ON.	None

Configure Modules in RSLogix 5000 Software

About This Appendix

Read this appendix for information about how to configure your modules in RSLogix 5000 software, including how to complete entries on the following dialogs, which are not available for Listen Only connections.

- Feedback
- Conversion
- Input Registration
- Watch Position

Understand Data, Connection, and Communication Formats

Before you configure your modules, note the following about Data formats and Connection types.

- Data format type is Integer.
- Connection types are as follows.
  - Data
  - Listen Only

Communication formats for adapters are as follows.

- Listen Only - Rack Optimization
- None
- Rack Optimization

Choices for formats for the module depend on the Communication format for the adapter. See the table for a listing of possible module Connection formats based on adapter Communication formats.

Adapter Communication Formats	Possible Module Connection Formats
Listen Only - Rack Optimization	Data (default)
	Listen Only
None	Data (default)
	Listen Only
Rack Optimization	Data (default)
	Listen Only

When you change Connection and Data Format, note the following.

- You do not delete the existing module.
- You do not create a new module.
- You bring forward all possible configuration data for the new setting.
- Configuration data that you cannot bring forward sets to the default value.

Once you apply new settings, this becomes the base configuration for the next change in Connection and Data Format settings. When you select Apply, you lose all configuration data from previous data formats.

Configure Your Module

To configure your module in RSLogix 5000 software, complete the following.

1. Configure your adapter.

   Refer to the user manual for your adapter for information on how to configure the adapter and add modules to the I/O configuration to include selecting a controller and communication module.

2. Add a 1734-SSI specialty module, according to the instructions in your adapter user manual.

3. From the General dialog, access the following by clicking at the top of the dialog, completing the entries as explained in this chapter.
   - Feedback
   - Conversion
   - Input Registration
   - Watch Position

Use the Help Button

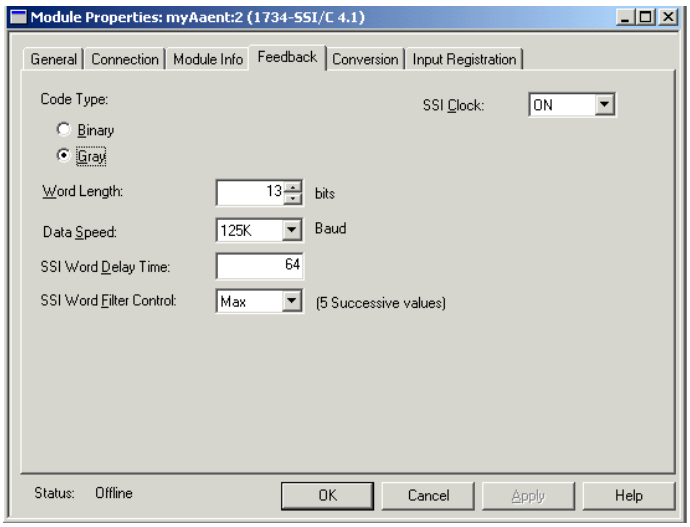
Click Help at the bottom of the dialogs described in this chapter for information about how to complete entries on the dialogs.

From a warning dialog, click Help at the bottom of the dialog to get information about that specific error.

Work with the Feedback Dialog

Follow these procedures to complete entries for the Feedback dialog.

1. From the General dialog, click Feedback to display the Feedback dialog.



2. From the Feedback dialog, complete entries, referring to the table.

3. From the Feedback dialog, complete one of these.
   - Click OK to save changes and close the dialog.
     or
   - Click Cancel to return to default values.
     or
   - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.
     or
   - Click another tab at the top of dialog.

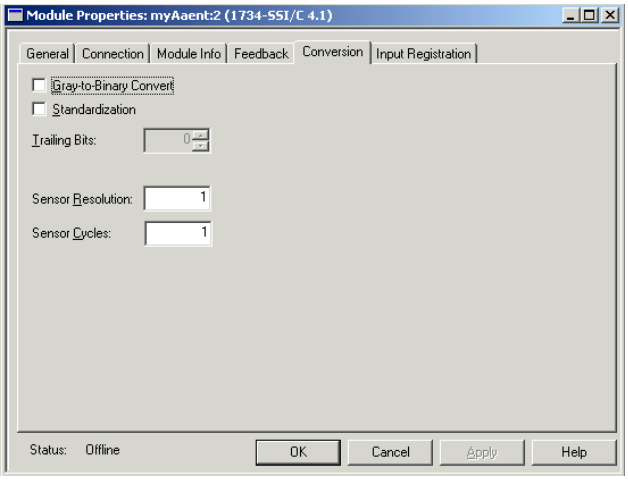
For	Select	Comments
Code Type	Binary or Gray	Default is Gray.
Word Length	2…31	Default is 13.
Data Speed	125 Kbps 250 Kbps 500 Kbps 1 MBps 2 MBps	Default is 125 Kbps.
SSI Word Delay Time	16…65535	Default is 64 µs.
SSI Word Filter Control	Max High Med Low Off	Default is Max.
SSI Clock		Select On or Off to select the SSI clock.

For more information on these parameters refer to the definitions in Chapter 4 of this publication.

Work with the Conversion Dialog

Follow these procedures to complete entries for the Conversion dialog.

1. From the General dialog, click Conversion to display the Conversion dialog.



2. From the Conversion dialog, complete entries, referring to the table.

3. From the Conversion dialog, complete one of these.
   - Click OK to save changes and close the dialog.
     or
   - Click Cancel to return to default values.
     or
   - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.
     or
   - Click another tab at the top of dialog.

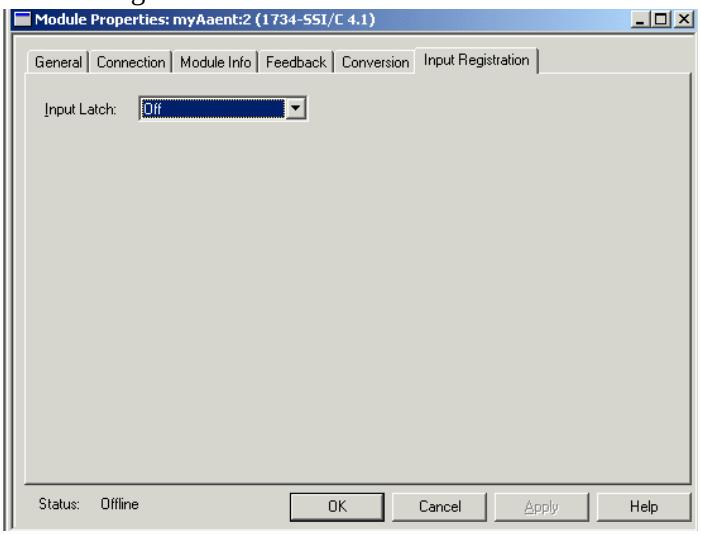
For	Select	Comments
Gray-to-Binary Convert	Click the checkbox	Default is no Gray-to-binary convert with the checkbox not checked.
Standardization	Click the checkbox	Default is no standardization with the checkbox not checked.
Trailing Bits	0…16	When you check Standardization, Trailing Bits is selectable. Default is 0.
Sensor Resolution	1…65535	Default is 1.
Sensor Cycles	1…65535	Default is 1.

For more information on these parameters, refer to the definitions in Chapter 4 of this publication.

Work with the Input Registration Dialog

Follow these procedures to complete the Input Registration dialog.

1. From the General dialog, click Input Registration to display the dialog.



2. From the Input Registration dialog for Input Latch select one of these, with Off being the default.
   - Off
   - Off-to-On
   - On-to-Off
   - Both Edges

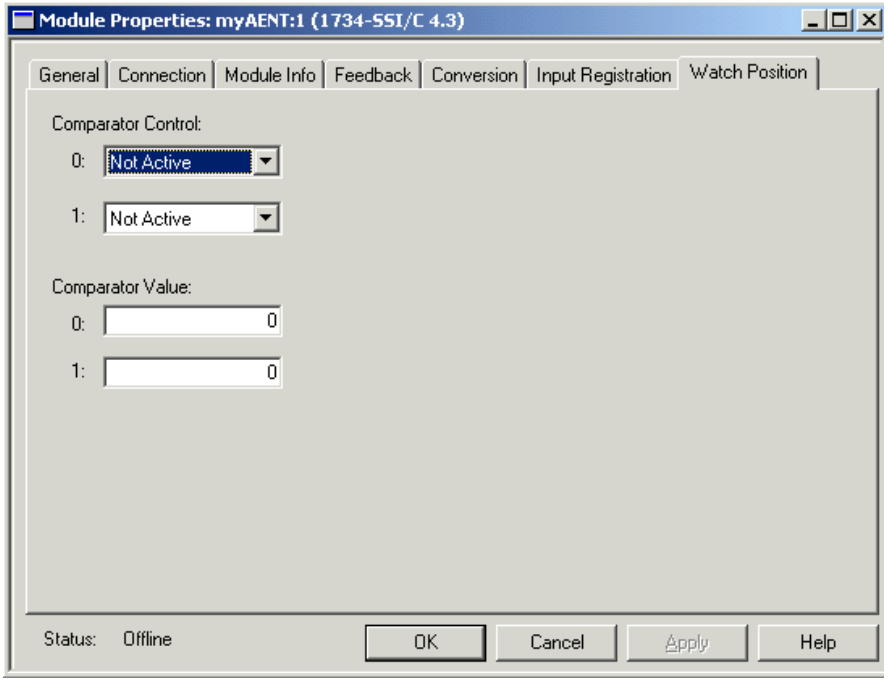
3. From the Input Registration dialog, complete one of these.
   - Click OK to save changes and close the dialog.
     or
   - Click Cancel to return to default values.
     or
   - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.
     or
   - Click another tab at the top of dialog.

Work with the Watch Position Dialog

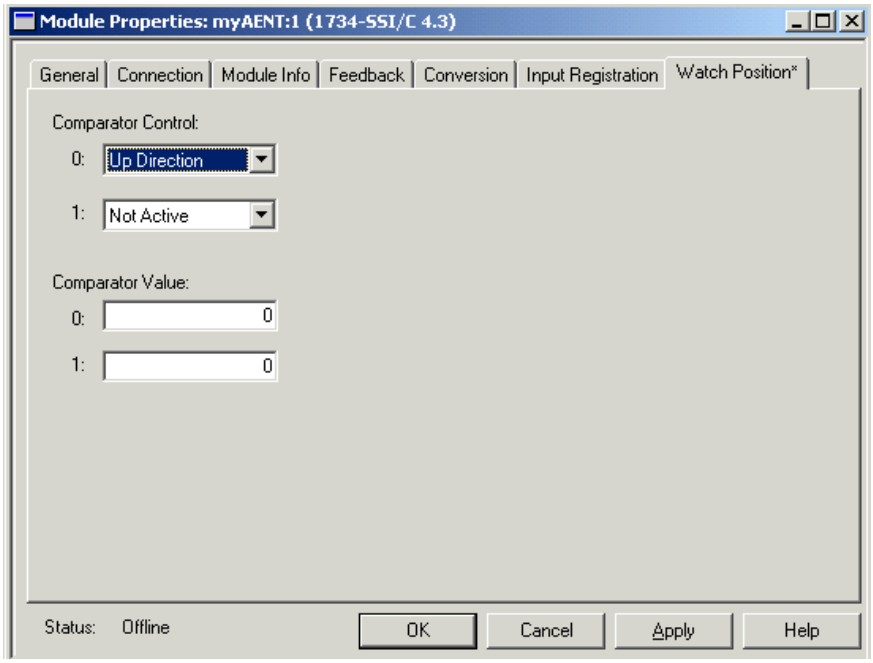
Follow these procedures to complete the entries for the Watch Position dialog, refering to the Comparators 1 and 2 section of the Set and Operate Your Module chapter for a description of:

- Comparator Control and Comparator Value
- Manual and Automatic mode

1. From the General dialog, click Watch Position to display the Watch Position dialog with the Not Active default for Comparator Control 0 and 1.



2. From the Watch Position dialog, make entries for Automatic or Manual mode, refering to the table and noting the following.
   - For Automatic mode for Comparator Control 0 and 1, leave the value as Not Active and complete the entries for Comparator Value 0 and 1.
   - For Manual mode, click a value for Comparator Control 0 and 1 and complete entries for Comparator Value 0 and 1, noting that in the figure the value shows Up Direction for Comparator Control 0.



Comparator Control 0 and 1		Comparator Value 0 and 1	
Automatic	**Manual**	**Automatic**	**Manual**
Not Active	Not Active Up Direction Down Direction Both Directions	0…4294967295 with a default of 0	

3. Perform one of the following.
   - Click OK to save changes and close the dialog.
     or
   - Click Cancel to return to default values.
     or
   - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.
     or
   - Click another tab at the top of dialog.

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Publication 1734-UM007D-EN-P - December 2005 PN 957988-74
Supersedes Publication 1734-UM007C-EN-P - August 2005
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